

REFLECTIONS / REFRACTIONS

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University Lowbrow
Astronomers

September 2006

Volume 30 Issue 8

Club Discounts for Sky & Telescope and Astronomy Magazines

By Kathy Hillig

At the back of each Newsletter, you see the blurb about discounts for *Sky & Telescope* and *Astronomy* magazines and having seen it for at least the current millennia, ignored it for the most part. Every year around this time, the two magazines send me the renewal rates for the next year and a list of current subscribers from the club with their subscription expiration dates. For most long-time members, this won't be new information, but there are enough new members which only get a one-liner in the welcome message I e-mail to them saying – "and you can also get a discount for some magazines, ask me about it if you're interested" – that I thought I ought to put some information in the Newsletter.

Subscription Details

Here are their rules for club rates:

Sky & Tel – minimum of five members subscribing (we have 23 members who subscribe)

annual rate is \$32.95, they do not offer a two year rate [from \$42.95]

must pay through the treasurer to verify that the member is "in good standing of their club"

Astronomy – minimum of five members subscribing (we have 8 members who subscribe)

annual rate is \$ 34.00, two year rate is \$60.00 [from \$40.80 or \$75.95]

must pay through the treasurer

Lowbrow Procedures

When they send me the list of members, it is on a form where I can collect all the renewals at one time and send it back to the magazine. I think they prefer this way, so that they process it all at once, generating the savings they expect, allowing them to offer a lower club subscription rate. We can also renew anytime of the year, which is how we do it and so, have expiration dates all through the year. The process is for the subscriber to write a check to "University Lowbrow Astronomer", and give it to me with your renewal form. I verify that you have paid your dues (i.e., a "member in good standing"), deposit the check in the Lowbrow account and send a separate check with a letter to the magazine. I usually wait until I have several *Sky & Tel* renewals and send a letter with one check using one stamp and envelope. It seems, inevitably, I will receive in the mail, another renewal request from a member the day after I've just sent a bunch to the magazine. So occasionally, I have to send it in one by one. Since there are so few *Astronomy* subscriptions, none expire at the same month, so those are usually done individually. It is more work on my part and I'm sure the magazine doesn't like having to process them one at a time either. The other option is to require everyone to renew at one time, no matter when your subscription actually expires. I'm not advocating that, but it is an option. Note, that we are getting near the minimum number of subscribers for *Astronomy*. If we get below 5 subscriptions, we would no longer be eligible for the discount.

Why so early?

Have you noticed how early the renewal notices come relative to the date your subscription expires? Have you ever gotten a second notice? Or a third? Or a final notice – "Your subscription has expired. You may have already missed one issue and are in danger of missing more." That one was mailed in June for a subscription ending in October. In May, Kurt got a third notice and it doesn't expire until December. When you get your renewal, you probably think – oh, I have plenty of time to get this to Kathy. It's only July and my subscription goes until December. Well, have you considered how much time it takes to process the renewal? Let's work backwards from the time the magazine is delivered. On one of the notices, it says "Remember that we mail your magazine ahead of time so your last issue will be sent a few months before the actual expiration date." When do you expect to get the monthly issue? I'd want it at least by the first day of the month (except for this Newsletter). When does *Sky & Tel* really arrive? Usually early the month before! So an October issue will actually be mailed in early September or even earlier. So, they must prepare the mailing labels before that issue goes to press. "Example: If your expiration date is October 2006 the issue labels will be sent to our printer in early August 2006". This means they need to have your renewal in July at the latest. *Astronomy* also gives a warning on their renewal form – "Last Issue: 10/2006; Expected Mail Date: 8/28/06"

Backing up time-wise from there, I have to process your renewal, deposit your check, send the letter, etc. - for our records as well. And if I wait to combine a bunch of renewals at once, add on a week or two. And if you wait for a Lowbrow meeting to give it to me, that is a once a month event, and additional delay. So you really need to get the renewals to me as soon as you get the first notice. Otherwise, you might miss an issue of *Sky & Tel* or *Astronomy*.

Take home message from the Treasurer

Please don't delay renewing your subscription! Get the form and money to me at the Lowbrow meeting or mail it to me as soon as you get the renewal form. Thanks!

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Kathy Hillig—Club Treasurer

Important Club Info

- **Friday, September 15, 2006.** (7:30 pm). [Monthly Club Meeting.](#)
- **Saturday, September 16, 2006.** *May be cancelled if it's cloudy.* (Starting at Sunset). [Open House at Peach Mountain.](#)
- **Saturday, September 23, 2006.** *May be cancelled if it's cloudy.* (Starting at Sunset). [Open House at Peach Mountain.](#)
- **Friday, September 29, 2006.** (5:00 PM to Midnight). [The 10th Annual "Astronomy at the Beach" at Kensington Metropark.](#) Hosted by GLAAC (the Great Lakes Association of Astronomy Clubs).
- **NEW Saturday, September 30, 2006.** (11:00 am to 4:15 pm). [Sally Ride Festival.](#) Hosted by the University of Michigan and Sally Ride Science. The Sally Ride Festival is a science festival for Middle School Age Girls.

To Film or Not To Film..... Part II

By Clayton Kessler

August 28, 2006

In the talk I gave at the May Lowbrows meeting I indicated that I was researching the purchase of either a DSLR or a CCD camera of some kind to add another dimension to my astrophotography. I even showed some CCD images that I had taken using borrowed cameras of various types. I have continued my research and I thought it was time for an update..... or a report from the bottom of the learning curve!

As the summer has progressed I have tried more CCD techniques including h-alpha imaging which I like a lot! My best result was a shot of M8 in h-alpha light using an ST7 CCD camera.



I really like the detail captured with this technique, and the fact that moon glow has basically no effect on h-alpha imaging. What I did not like was the uncomfortable, to me, feel of the equipment. SBIG makes some wonderful instruments but they don't "feel" like a camera. I thought I needed to take a look at the different options and figure out what I was willing to plunk my hard earned dollars on.

CCD:

- CCD cameras have a lot of capability.
- One NEEDS a computer to use them.
- They are very sensitive.
- It is difficult to take wide field shots with camera lenses with them.
- The sensors are small.
- It is easy to shoot in specific light wavelengths with them.
- The filters are expensive.

DSLR:

- DSLR's look and feel like a camera.
- The sensors are large – many mega pixels.
- The sensors are not as sensitive as most CCD cameras.
- The sensors are low noise.
- No computer is needed to take astrophotos with them.
- The sensor filter (hot mirror) must be modified to increase sensitivity in h-alpha.
- Once the hot mirror is modified they can be used to shoot specific wavelengths of light.
- The filters are expensive.
- It is easy to take wide field shots with them.
- They can be used for other photographic needs.

And very importantly – used DSLR's are less expensive than used CCD cameras in the ST7, ST8, ST2000 range.

All this time I have been checking Astromart to figure out just what this addition to the hobby is going to cost. I was looking at CCD cameras in the ST7, ST8, ST2000, HX9 class and at Canon DSLR's. I was tracking ebay auctions for Digital Rebels and 10D's. I had it BAD!!!

It was Jeff Thrush that found the 10D on Astromart. It was a weekend and I usually check A-mart from my office – I could not remember my password!!! Jeff being the pal he is e-mailed the guy and purchased the camera for me.

I was anxious to get the camera and when it came I wasn't disappointed! The camera looked brand new and it looked like a CAMERA! I borrowed a lens, loaded a compact flash card (gotta love digital film) and started to familiarize myself with this beast.

There is at least one disadvantage to a DSLR. As they come from the factory (with the exception of the Canon 20Da) they have poor response to h-alpha light. Just how poor the response will be was a big question in my mind.

A few accessories are necessary to take astrophotos with one of these. A "T" ring is needed to connect to the telescope as you would expect. One also needs the special remote shutter release – my releases that I use with my film cameras don't work with the digital setup. I also highly recommend an AC adapter to eliminate the battery. There are no time limitations on your exposures if you have the AC adapter.

A couple of good weekends came up in August and I was ready. In order to have an easy focus method I set up my Taurus Tracker and "calibrated" the camera and an eyepiece. This gave me a good focus through the telescope without further adjustment. Because I wanted to use the Taurus Tracker I decided to image through my 4" f6 achromatic refractor.



M20 and M21 with total of 16 minutes exposure:

I was surprised at the amount of red h-alpha that I was able to capture. Still I would rate the response as similar to mediocre film response. Over the next several astrophoto sessions I captured these:



M8 – 16 minutes exposure.

I got more h-alpha than I expected on this one.



The western segment of the veil – NGC 6960.

The h-alpha is dim enough so most of what I captured was OIII. This will need a lot more than the 30 minutes of exposure that I have given it.

I am looking forward to more clear sky to continue fine tuning my techniques with this camera. It seems pretty easy to use because of it's similarity to film SLR's. Of course, I expect that I will "accessorize" this system over the winter. I have already ordered a special low profile focuser to install on my 6" f5 Schmidt Newtonian. This will let me use the Taurus Tracker to guide with on that scope. I will also modify the camera this winter to remove the "hot mirror". This will let me take h-alpha or OIII exposures with the DSLR.

I am also going to automate the exposure process using a laptop. (Hey I said you didn't NEED a laptop – not that it wouldn't be handy). The exposures taken with a DSLR are generally in the 2 minute to 5 minute range – not much time for a nap like the 1 ½ hour film exposures. The proper software can control the camera to take a series of exposures, for example 60 two minute exposures of an object, relieving me of the necessity of paying close attention to the manual exposure switch.

All in all I am excited about the DSLR. I suspect that I will have a lot of fun as I climb the learning curve. Hey! Any cool new comets coming up?

Telescope Shopping

By Tom Ryan

I work as an optical engineer at a number of companies and, like a doctor at a party, I get asked about odd, personal optical problems by the people who work there. Some of the questions are fairly normal (Q. “My shaving mirror gives me a double image when I shave. Would a first-surface mirror be sharper, and if so, where can I get one?” A. “Yes, it would be sharper. You can get one either out of some kinds of old overhead projectors, or you can use one of those large rectangular, adjustable side view mirrors from a truck. They're not really front surface, but they work as if they were.”), some are unusual (Q. “I bought a security camera to look through a hole in a wall, but it won't focus close up. How can I fix this?” A. “Buy a one-diopter positive lens from a camera store, tape it to the front of the security camera lens, and never tell me what this is used for.”), but most of them are about telescopes, as in, Do you own one? and What kind should I buy?.

Recently, while I was at one of the companies, a mechanical engineer dropped in to the office the company lets me use for their work and asked me the doctor question.

“Tom. You know about telescopes. I was at Costco yesterday and I saw a really big telescope. It had a big lens on it.” He showed me how big the lens was by making a circle with his fingertips. “Do you know if this telescope can take pictures? It is really cheap. \$250.00. My wife says I can buy it.”

Now, I've met his wife. She is smart, attractive, and very nice. I don't think either he or she would be satisfied by a department store refractor, so I bit the bullet and decided to help educate him in what is available in telescopes today.

Not that I really know. I haven't seriously considered buying a telescope for several years. Well, I bought an 8" orange-tube Celestron because I needed a telescope for a project I was working on, and I bought an 8" reflector from Nathan, because he recommended it, but I haven't considered buying one from a store. I just don't observe much anymore, although I used to. I stopped when I found that when I looked through a telescope, instead of seeing planets or stars or nebula, I just saw aberrations in the optical system. This is difficult for a man whose religion is light. Since that time, I've treated telescopes like women at parties; Lovely to look at, delightful to hold, but if you use it, consider it sold.

Now, given the fact that time marches on and things change in the process, that telescope at Costco might have been fine, much better than the ones available when I was a teenager. Physics, however, doesn't change much at our level, and if my friend, the mechanical engineer, wanted to take pictures of lots of stuff, he probably would want an 8" telescope.

The next time I headed over to that company, I loaded up the car with the Celestron, the 8" reflector, and some eyepieces, so he could do a comparison. I had recommended that he and his wife visit Peach Mountain during an Open House to see what the club members used and liked, but Michigan skies were not cooperating with that plan. We set up the telescopes in front of the company's entrance, where we had a good view across the parking lots, all the way down to the horizon and to the buildings in downtown Ann Arbor.

I put a 24mm Brandon eyepiece in the Celestron, and let him look at some distant tree branches. He asked how a camera could be connected to the scope, how the focusing worked, and why was the image upside down? The last question surprised me, because, while the image really was upside down, I had stopped noticing that years ago. Then I put a 9mm Burgess/TMB eyepiece in the Celestron C-8, secretly proud of the fact that a 9mm eyepiece could have so much eye relief because of its clever optical design.

“This image is much darker. I think the other eyepiece is brighter. The other eyepiece was much better.”

I stared at the Brandon wordlessly. He was obviously looking at this whole process very differently than I was. But, he was the one who knew what he wanted.

“Well. Maybe it is better.”

He looked at the 8" Newtonian, and wanted to know why the telescope was less powerful, when it was much bigger than the Schmidt-Cassegrain Celestron. This led to an explanation of folded optical paths, light convergence cones, and other such things, which probably made only a slight impression on him, fortunately.

Finally, we got around to a discussion of what I think are the really important things; quality, price, and portability. Quality must be verified personally for any scope, the C-8 costs more, and it is more portable, and therefore more useable.

"What about GoTo? That's important, isn't it? Can your telescope be fitted with a GoTo system? It's just motors, right?"

He had noticed that the C-8 had an electrical plug on it for the sidereal drive, a retrofitted Astromaster taped to the fork arms, and aftermarket encoders. Being a mechanical engineer, he knew that motors could be fitted to just about anything (including can openers, which, personally, amazes me). He also had a healthier respect for what is reasonable and possible than I do, so when I told him that a GoTo scope had to be purchased with the system already installed by the factory, he accepted that.

He still was confused by a lot of things, and I was having a hard time getting to a point where I told him as much as he needed to know, but not too much to absorb. Why is the field upside down? Why is one eyepiece brighter than another? There are answers to these questions, but I can't supply them, along with an overview of the market, in 45 minutes. I sometimes run into this same problem when talking to engineers in their 20's about why it might be a bad idea to use Teflon to support lenses, or why it is a bad precedent to deny access to lawyers to people accused of crimes. It takes time to fully understand some things, and as Poul Anderson said, you can't ripen a field before its time.

At this point, I was feeling completely inadequate to the task of filling him in on the details of what might be important to him, so it was time for professional help; a trip to Riders Hobby and Mark Rotenberg.

We got in the engineer's car and drove over to Rider's. Mark wasn't there, but a salesperson named Brent helped us out. He gave my friend an excellent overview of the scopes available, what their features were, and what they cost. Unfortunately, Rider's didn't have as great a selection as they did a year ago. Brent explained that Celestron and Meade were having trouble keeping up with orders while maintaining quality (would anyone else like to move production to China?), but they should have some more scopes in by September.

Rider's did have some small telescopes. They had a three or four inch reflector on an equatorial mount, which was so wobbly it scared me, but did serve as an interesting example, and they had a nice 6" Dobsonian. The Dob had a readout system on it. I had been telling the engineer that he could get an older 8" Schmidt-Cass for about \$500, tripod and all, and retrofit it with one of these readouts for another \$500. That didn't seem like such a good deal to my friend, even when Brent pointed out that the readout wasn't \$500, it was \$125. My friend wanted a GoTo system. He wanted the scope to move under his command, and who can blame him? I have often thought that motorizing inanimate objects is the male equivalent to a woman's desire for children. I personally think kids are fun, but a robot, now, that's something!

We looked at pictures of the scopes that Brent would be getting in later, and Brent recommended that we take a short drive over to Rider's Livonia store, and talk to John Kirchhoff, the store manager. John knew more about telescopes than anyone in the Rider's chain, and he wouldn't carry a telescope if he thought it wasn't any good. Brent also said that the Livonia store sold more telescopes than any other store in the Midwest, which amazed my friend, and me, too, actually.

"It's so cloudy here. Why would so many people buy telescopes?" my friend asked. "I don't know", I replied, but I think it's like Audrey Hepburn. Being unobtainable just makes you want it more.

My friend praised the staff of Rider's as we got back into the car. I don't know what he will decide to buy, or when, but at least I hope I helped him avoid the department store telescope.

2007 Calendar and Observer's Handbook

Kathy Hillig

It is almost time to start thinking about 2007 calendars and Observer's Handbooks. I don't have the final prices yet, but will take orders starting at the September meeting. The ordering period will continue until the end of October so that the items will be available for pick up at the November or December meetings. That will be just in time for giving Christmas or Hanukkah gifts. They will be from the Royal Astronomical Society of Canada (RASC). So far, the price of the calendar didn't change, however they doubled the shipping and handling fee, so there will be a slight increase for each calendar. They have not announced the Observer's Handbook prices yet. I'll let you know at the September meeting.

Refractor on the Cheap

By Doug Nelle

Introduction

A little while ago, OK it was 3 years but who's counting, I wrote an article about a tripod I built using crutches. At the end of that literary masterpiece I threatened to write about the scope I put on it. So grin and bear it.

A few years before the tripod was made I had purchased one of the used refractor objectives that had been appropriated by one of the Lowbrows from KMS Fusion when that business had closed their doors. It took a year to come up with more money and then I jumped into the project to turn the 5 inch f/5 Jaeger's achromatic lens into a scope. A little confession at the beginning, the tube assembly was mostly built before I made the tripod. An early test on a prototype pier mount made from PVC pipe proved too unstable. So I made the tripod and then finished the scope.

Construction

The lens came in a cell so I didn't have to worry about having one machined. The idea was to be able to make the tube assembly with just power hand tools and hardware purchased at the local store. The only items I purchased from vendors were the focuser and an azimuth pivot bolt/bushing. More about the pivot bolt later.

The tube was a 2' chunk of a longer 6' aluminum piece that had a 6" inside diameter bought at a junkyard. It was part of a hoist because it had a sticker on it warning not to run the hoist if something wasn't secured. Not bad advice when using your telescope either.



The finished scope is seen in fig. 1. The azimuth counterweight is a box containing a 12v battery for anti-dewing. Figure 2 shows the battery and the connecting cable to the tube. Wiring is run internally to a rear plate (fig. 3) with switches for turning

on 12 volts to eyepiece and finder connectors and to turn on power to the objective heater. The objective heater is 12 volt heat rope bought at a swap meet wound around the cell.

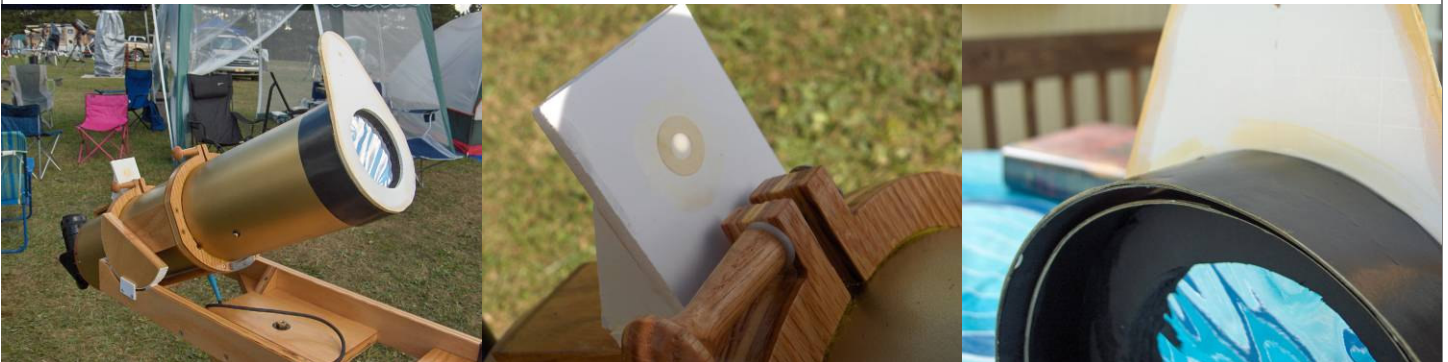
Mounting the cell inside the tube and still allow for aligning the objective took a few seconds of thought because there wasn't sufficient clearance between the inside diameter of the tube and the outside diameter of the cell to permit using a push-pull arrangement of bolts. What I did was to make a plywood ring that fit over the smaller rear end of the cell that had the same outside diameter as the inside diameter of the tube. This ring was siliconed to the objective cell. 3 wood screws through slightly oversized holes in the tube screw into the wood ring. To adjust the cell (adjustment was necessary to get round star images) you loosen a screw and move it forward or back in the hole and retighten. You can see these screws in figures 1 and 5 about a third of the way down from the top of the tube. Recessing the objective back allowed the tube to be both a glare and dew shield. Moving toward the rear of the tube assembly there are 2 internal glare stops.



The rear plate (fig. 3) is one piece of ¾" oak cut out with a router. The forward side has a smaller radius cut on it so it will slide up in the tube. Making the ring that the focuser fits into is the only time I used a bench tool during the project. The two radii were cut with 2 different hole saws on a drill press where I work.

Figure 4 shows the finder platform, the altitude bearings and the tube clamps. The finder platform has a T nut underneath so that different finders could be mounted. A BB gun sight finder is what I normally use for night work. The bearings are FRP (fiberglass reinforced panel), also known as glass board on Teflon. There are no hinges on the tube clamps. Machine screws in the wood drawer knobs go through to T nuts on the other side of the clamps. Felt on the inside of the clamps keeps the clamps from scratching the tube. The scope tube itself was painted with an automotive aluminum

wheel primer and a gold/brass top color to give it a fake brass look. The tube clamp/altitude bearing stays on the scope during storage.



A solar filter

Figures 5, 6 and 7 show an aluminized mylar solar filter I made. It was constructed using foam core posterboard normally used for science fair displays and heavy black construction paper. It has a 4" clear aperture. In figure 7 you can see there are 2 rings built up from the construction paper. One fits over the scope tube and one fits inside. It's a very snug fit over the end of the tube. The filter takes some force to put on or take off. It's not going to blow off in the wind. Figure 6 shows the "finder" for solar viewing. A pinhole in the foam board of the filter projects a spot on a target made from the posterboard. A paper reinforcing ring serves as a bull's-eye.

Things I did right

I kept it inexpensive. The "previously owned" objective was \$100. The focuser was just over \$100. The 12 volt 12 amp-hour anti dew battery was \$25. The aluminized mylar is one corner of a square foot piece of Baader Planetarium filter material I got at the Chicago Astronomical Society's Astrofest star party for \$10 (instead of the usual \$40) because the sheet had a cosmetic crease in it. The BB gun sight finder was won as a door prize at the Black Forest star party for the price of a couple tickets. The aluminum tube was \$20. I should also include the \$70 for the 2" mirror diagonal seen in the pictures because I only use it with this scope. There was probably no more than \$40 in parts for the rest of the tube assembly and altaz. mount.

It sets up quickly. It's only 10 minutes from when I decide to do some solar observing to when the tripod, scope, diagonal, eyepiece and solar filter are in the yard and ready to go.

Things that went wrong or I would do differently

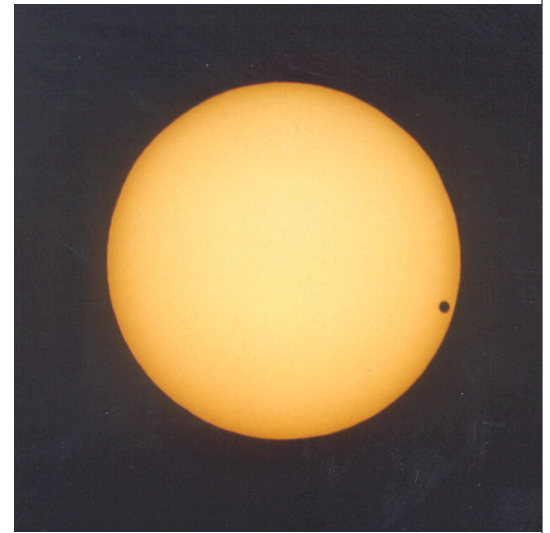
The first altitude bearings were 2" PVC pipe floor flanges. They worked great! Way too great! You couldn't change focus without the scope running away in altitude. So I changed them to the 6" diameter wood with FRP board ones seen in the pictures. Larger wouldn't hurt.

The tube clamps work fine but they were a bit of a hassle to construct and if I want to take the scope out of the

clamps I have to slide the tube assembly out one end. You can see a notch in the front clamp at the 8 o'clock position in fig. 5 so that it can slide past the screw heads in the tube assembly. I might consider a clamshell type clamp with hinges and latches in the future.

I bought a commercial azimuth pivot on a lark just to see what was so great. In a nut shell nothing, unless you were going to use digital setting circles. The pivot is bored out on the top to accept a shaft encoder. Otherwise just buy a shoulder bolt, a bushing and a T nut at the hardware store. I hope all the scrounging, recycling type ATMs out there will forgive me for this momentary lack of ethics.

I like the look of the tube but if I were to do it over I think I would make a square wood tube. There would be no work cutting circles with the router. No need for tube clamps, just a way to slide the altitude bearings a little. And plenty of room in the corners around the objective for alignment bolts. Plus a few bucks less in cost.



Observing highlights

I mostly use a surplus 2", 28mm f.l. eyepiece seen in the pictures that gives a 3 degree field of view at 22x. With plenty of poor images at the edges! None the less I love the wide angle views it affords. I also made the length of the tube such that I could put a 35mm camera on to take shots of the moon and sun. Some of the things that stick in my mind over the last few years are:

2 total lunar eclipses with lots of Cub Scouts in tow. (fig. 8)

The transit of Venus across the sun observed with my daughter. (fig. 9)

Comet C/2001 Q4 (NEAT) going by the Beehive.

Any open clusters visible. Views of these objects have earned scopes of this type the name "Cluster Buster" by some club members. The view of M46, M47 and NGC 2423 in Puppis in the same field is to kill for!

But wait! There's more!

Low power wide angle views are a joy. Especially when done at dark observing sites. You do not need a multi thousand dollar apochromatic objective to enjoy these types of views. If you ever get the chance to pick up an f/5 or f/6 lens consider the ease of use and the great views you will get and build a scope!

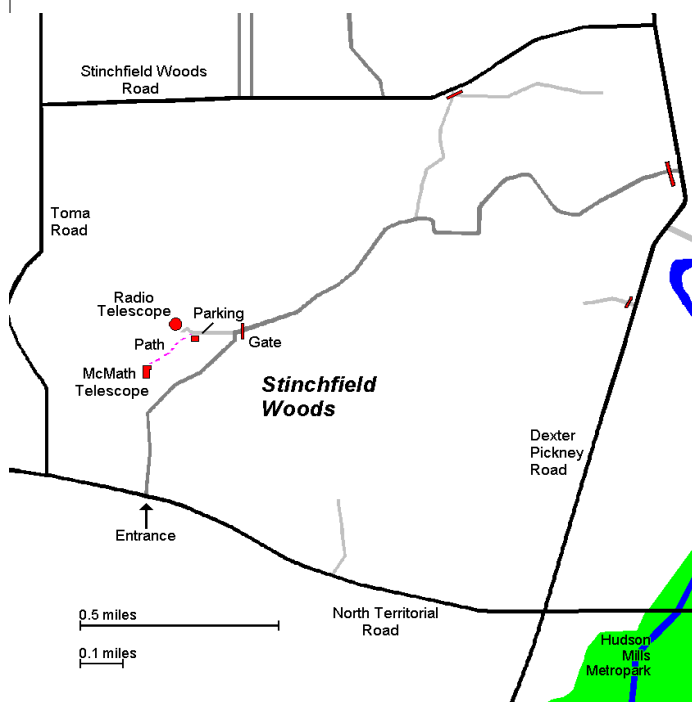
And next?

For this scope probably a nice wood case to store it in instead of the cardboard box it's in now. I just need to find some thin plywood lying around.

Places & Times

Dennison Hall, also known as The University of Michigan's Physics & Astronomy building, is the site of the monthly meeting of the University Lowbrow Astronomers. Dennison Hall can be found on Church Street about one block north of South University Avenue in Ann Arbor, MI. The meetings are usually held in room 130, and on the 3rd Friday of each month at 7:30 pm. During the summer months and when weather permits, a club observing session at the Peach Mountain Observatory will follow the meeting.

Peach Mountain Observatory is the home of the University of Michigan's 25 meter radio telescope as well as the University's McMath 24" telescope which is maintained and operated by the Lowbrows. The observatory is located northwest of Dexter, MI; the entrance is on North Territorial Rd. 1.1 miles west of Dexter-Pinckney Rd. A small maize & blue sign on the north side of the road marks the gate. Follow the gravel road to the top of the hill and a parking area near the radio telescopes, then walk along the path between the two fenced in areas (about 300 feet) to reach the McMath telescope building.



Public Open House / Star Parties

Public Open Houses / Star Parties are generally held on the Saturdays before and after the New Moon at the Peach Mountain observatory, but are usually cancelled if the sky is cloudy at sunset or the temperature is below 10 degrees F. For the most up to date info on the Open House / Star Party status call: (734)332-9132. Many members bring their telescope to share with the public and visitors are welcome to do the same. Peach Mountain is home to millions of hungry mosquitoes, so apply bug repellent, and it can get rather cold at night, please dress accordingly.

Membership

Membership dues in the University Lowbrow Astronomers are \$20 per year for individuals or families, \$12 per year for students and seniors (age 55+) and \$5 if you live outside of the Lower Peninsula of Michigan.

This entitles you to the access to our monthly Newsletters on-line at our website and use of the 24" McMath telescope (after some training).

A hard copy of the Newsletter can be obtained with an additional \$12 annual fee to cover printing and postage. Dues can be paid at the monthly meetings or by check made out to University Lowbrow Astronomers and mailed to:

The University Lowbrow Astronomer c/o Kathy Hillig

**7654 W. Ellsworth Road
Ann Arbor, MI 48103**

Membership in the Lowbrows can also get you a discount on these magazine subscriptions:

Sky & Telescope - \$32.95 / year

Astronomy - \$34.00 / year or \$60.00 for 2 years

For more information contact the club Treasurer. Members renewing their subscriptions are reminded to provide the renewal notice along with your check to the club Treasurer. Please make your check out to: "University Lowbrow Astronomers"

Newsletter Contributions

Members and (non-members) are encouraged to write about any astronomy related topic of interest. Call or Email the Newsletter Editor: **Mark S Deprest (734)223-0262** or msdeprest@comcast.net to discuss length and format. Announcements, articles and images are due by the 1st day of the month as publication is the 7th.

Telephone Numbers

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Lowbrow's Home Page

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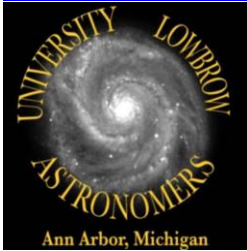


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Reflections & Refractions



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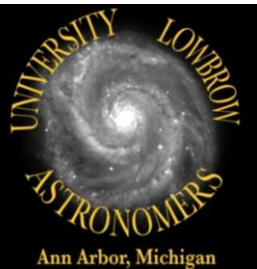
All images in "To Film or Not to Film ... Part II" provided by Clay Kessler.

All images in "Refractor on the Cheap" provided by Doug Nelle.

Top left—Tom Ryan

Top right—Clayton Kessler

Bottom left—Doug Nelle



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